

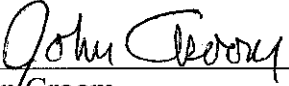
DATE: May 11, 2004

TO: Distribution

FROM: SGT NENS Documentation

SUBJECT: DCN 002 to WDISC Service Specification

Attached is DCN 002 to the WDISC Service Specification document, CSOC-GSFC-RD-002056. This DCN is a result of an update to the Preface; Paragraph 1.4 reflecting updated document numbers; Table 2-1 and B-2 reflecting expansion User Interface Channels, and Appendix A, Acronym List. The DCN 002 copy of the document can be found on the Online Library and WDISC Web site. This can be downloaded and printed out.



John Groom
NCC Miscellaneous Systems (NCCMS)
Sustaining Engineering Review Board (SERB) for the WDISC

Distribution:

J. Baker
M. Benjamin
K. Chambers
J. Chavez
D. Glasscock
M. Goen
A. Rausch



Consolidated Space Operations Contract

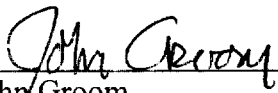
DATE: April 9, 2003

TO: Distribution

FROM: AS&T/Information Data Management

SUBJECT: DCN 001 to WDISC Service Specification

Attached is DCN 001 to the WDISC Service Specification document. This DCN is a result of system enhancements pertaining to automated scheduling of the WDISC system and expansion of the PTP boards. Discard the current Service Specification document and replace with the attached.



John Groom

NCC Miscellaneous Systems (NCCMS)

Sustaining Engineering Review Board (SERB) for the WDISC





Consolidated Space Operations Contract

WSC Transmission Control Protocol (TCP) /Internet Protocol (IP) Data Interface Service Capability(WDISC) Service Specification

August 17, 2001

Effective: August 17, 2001

Contract NAS9-98100

Consolidated Space Operations Contract

WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) Service Specification

August 17, 2001

Effective: August 17, 2001

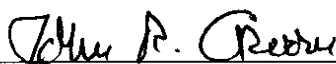
Contract NAS9-98100

Originally Prepared by:

Reine A. Chimiak
WDISC Team Lead
Code 583

December 1998

Approved by:




John R. Groom
GSFC Network Control Center
WDISC Sustaining Engineering
Honeywell Technology Solutions Inc.

8/15/01

Date

Approved by:



Jack Osborn
White Sands Complex
Systems Engineering Manager
Honeywell Technology Solutions Inc.

8/8/01

Date

This document supersedes WSC Transmission Control protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) Service Specification, 451-WDISC-SSD 98, December 1998. Dispose of superseded documents in accordance with CSOC-CEN-SOP-000205.

Change Information Page

List of Effective Pages			
Page Number	Version	Nature of Change	
Cover	Original	See Cover Memo	
Signature Page	Original		
Change Information Page	DCN 001		
DCN Control Sheet	Original		
Preface	DCN 002	See Cover Memo	
vi	DCN 002	See Cover Memo	
1-1	DCN 002	See Cover Memo	
1-2 and 1-3	DCN 001	See Cover Memo	
2-1	DCN 001	See Cover Memo	
2-2	Original	See Cover Memo	
2-3	DCN 002		
2-4 and 2-5	DCN 001		
3-1 and 3-2	DCN 001		
A-1 and A-2	DCN 002	See Cover Memo	
B-1 through B-3	DCN 002	See Cover Memo	
Document History			
Document Number	Version - Change	Issue Date	Effective Date
451-WDISC-SSD-98	Original (Retired 8/01)		
CSOC-GSFC-RD-002056	Original	August 17, 2001	August 17, 2001
	DCN 001	April 9, 2003	April 9, 2003
	DCN 002	May 11, 2004	May, 11, 2004

DCN Control Sheet

[illegible]

Preface

This document specifies the services provided by the White Sands Complex (WSC) Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC), defines customer interfaces with the WDISC and describes main operations of the WDISC.

This document was originally created under National Aeronautical and Space Administration (NASA) control. The WDISC system has been converted to Consolidated Space Operations Contract (CSOC) control and thus this document has been converted to CSOC control. This document was originally published in December 1998. Upon conversion, the document has retained most of its original content with the exception of an update to the Reference Document list that is in Section 1. In early 2003, updates were made throughout the document to reflect the 12/16/2002 change to NCCDS automated scheduling at the Data Services Management Center (DSMC) and the PTP expansion plan to double the number of PTPs.

This document is under configuration management of the Goddard Space Flight Center (GSFC) Network Control Center Miscellaneous Systems (NCCMS) Sustaining Engineering Review Board (SERB).

Proposed changes to this document must be submitted to the SERB along with supportive material justifying the proposed change.

Changes to this document will be made by Documentation Change Notice (DCN) or complete revision.

Comments or questions concerning this document and proposed changes shall be addressed to WDISC Sustaining Engineering:

John.Groom@gsfc.nasa.gov

Contents

Section 1. Introduction.....	1-1
1.1 Purpose and Scope.....	1-1
1.2 Context.....	1-1
1.3 Overview	1-1
1.4 References.....	1-1
Section 2. Interfaces.....	2-1
2.1 Transport-Level Interfaces	2-1
2.2 Application-Level Interfaces	2-4
Section 3. Operational Considerations.....	3-1
3.1 Nominal Operations	3-1
3.2 Failover Operations.....	3-2
Appendix A. Abbreviations and Acronyms	A-1
Appendix B. External and Internal WDISC Interfaces.....	B-1

List of Figures

Figure B-1. WDISC User Interface Channels	B-2
---	-----

List of Tables

Table 2-1. MOC Interfaces with WDISC	2-3
Table 2-2. Application Level Protocols for Data.....	2-5
Table 2-3. Application Level Protocols for Control and Status.....	2-5
Table 2-4. Application Level Protocols for Playback.....	2-5
Table B-1. IP Address Aliases	B-1
Table B-2. WDISC Internal Configuration	B-3

Section 1. Introduction

1.1 Purpose and Scope

The White Sands Complex (WSC) Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) supports customers who require TCP/IP access to the WSC for telemetry and command processing. Support is provided from the National Aeronautics and Space Administration (NASA) Integrated Services Network (NISN) Closed IP Operational Network (IONET), using a defined set of authorized addresses.

1.2 Context

The WDISC:

- a. Affords TCP/IP customers uniform access to Space Network (SN) services provided by the WSC ground stations.
- b. Uses a Programmable Telemetry Processor (PTP) a Commercial Off-the-Shelf (COTS) product to provide the required capabilities.
- c. Is scheduled and configured by the Network Control Center Data Systems (NCCDS) within the DSMC.
- d. Is compatible with the Consultative Committee for Space Data Systems (CCSDS) Telemetry and Telecommand services.

1.3 Overview

This document specifies the services provided by the WDISC. Section 2 defines the customer interfaces with the WDISC. Section 3 describes the principal operations of the WDISC. Appendix B provides details of the TCP/IP (external) interfaces and serial (internal) interfaces at WSC.

1.4 References

The latest version of the following documents is applicable.

- a. WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) Project Management Plan (PMP), CSOC-PLAN-002094.
- b. WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) System Requirements, CSOC-GSFC-RD-002090.
- c. WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service Capability (WDISC) Operations Concept, CSOC-GSFC-OC-002091.
- d. Interface Control Document (ICD) Between the Network Control Center (NCC) and the Mission Operations Centers, 530-ICD-NCCDS/MOC.

- e. Space Network (SN) User's Guide, 530-SNUG.
- f. Interface Control Document (ICD) Between the Network Control Center (NCC)/Flight Dynamics Facility (FDF) and the White Sands Complex (WSC), 530-ICD-NCC-FDF/WSC.
- g. Internet Protocol: DARPA Internet Program Protocol Specification, RFC 791.
- h. Internet Control Message Protocol, RFC 792.
- i. Transmission Control Protocol, RFC 793.
- j. File Transfer Protocol, RFC 959.
- k. Packet Telemetry. Recommendation for Space Data Systems Standards. CCSDS 102.0-B-4. Blue Book. Issue 4. Washington, DC: CCSDS, November 1995.
- l. Telemetry Channel Coding. Recommendation for Space Data Systems Standards. CCSDS 101.0-B-4. Blue Book. Issue 4. Washington, DC: CCSDS, May 1999.
- m. Packet Telemetry Services. Draft Recommendation for Space Data Systems Standards. CCSDS 103.0-B-1. Blue Book. Issue 1. Washington, DC: CCSDS, May 1996.
- n. Advanced Orbiting Systems, Networks and Data Links: Architectural Specification. Recommendation for Space Data Systems Standards. CCSDS 701.0-B-2. Blue Book. Issue 2. Washington, DC: CCSDS, November 1992.
- o. Telecommand Part 1 – Channel Service. Recommendation for Space Data Systems Standards. CCSDS 201.0-B-1. Blue Book. Issue 1. Washington, DC: CCSDS, January 1987.
- p. Telecommand Part 2 – Data Routing Service. Recommendation for Space Data Systems Standards. CCSDS 202.0-B-2. Blue Book. Issue 2. Washington, DC: CCSDS, November 1992.
- q. Telecommand Part 3 – Data Management Service. Recommendation for Space Data Systems Standards. CCSDS 203.0-B-1. Blue Book. Issue 1. Washington, DC: CCSDS, January 1987.
- r. PTP NT Programmable Telemetry Processor for Windows NT User's Manual, Version 1.40, Avtec Systems, November 1998, revised 30 December 1998.
- s. AVTEC PTP for Windows, Programmable Telemetry Processor User's Guide, Version 1.49, July, 19, 2001.
- t. Detailed Mission Requirements (DMR) Document for the Gravity Probe-B Mission (GP-B), 450-DMR-GP-B, Review Issue 5, May, 2001.
- u. Deep Space Mission System External Interface Specification, TLM-3-27, DSN Telemetry Interface with the Advanced Composition Explorer (ACE) 820-013 Rev. A, May 1999.

- v. Deep Space Mission System External Interface Specification JPL D-16765, TLM-3-29, Telemetry Standard Formatted Data Unit (SFDU) Interface 820-013, June 15, 2000.
- w. Epoch 2000 LEO-T Operations and Maintenance Manual Release 1.7, Integral Systems, Inc.
- x. Data Services Management Center System Requirements Specification, Rev D., DCN 001. August 2002, CSOC-CEN.SE11.001070.

Section 2. Interfaces

2.1 Transport-Level Interfaces

2.1.1

Customer access to the WDISC is via TCP/IP connection for forward and return services. For forward services, the customer sends data via TCP/IP to the PTP at WSC. The PTP then sends that data to the WSC Local Interface (LI) via one of three PTP boards. The particular LI port to be used is identified by User Interface Channel (UIFC) ID. For return data, the PTP receives the data from the WSC LI via one of three PTP boards. It frame-syncs to the data and performs processing on it if necessary. The data is then shipped to the customer via a TCP/IP connection. Mission-specific port numbers are assigned to each customer, as required, for control and data ports for forward services, and for data port(s) for return services.

2.1.2

TCP/IP client/server relationships are established on a customer-by-customer basis. The preferred configuration of the PTP is as a TCP/IP server, with the Mission Operations Center (MOC) initiating the connection. However, the PTP may be configured as a TCP/IP client, so that the PTP initiates the connection at the time that support is scheduled to begin. In the latter configuration, the customer (server) side is expected to accommodate receiving data from both PTPs (prime and backup) simultaneously.

2.1.3

Interfaces with the customer MOC are summarized in Table 2-1. Each service is identified by UIFC that appears in the User Schedule Message (USM) from the NCCDS. The corresponding domain names are listed. The two domain name entries correspond to the primary and redundant PTP hosts.

NOTE

Details of the IP address assignments and internal configuration of the PTPs are provided in Appendix B.

Table 2-1. MOC Interfaces with WDISC

Service	User Interface Channel	Domain Name XXX.ops.nascom.nasa.gov
Forward-1	W30	XXX=scctp1 or scctp2
Return-1	W55	XXX=scctp1 or scctp2
Control-1	–	XXX=scctp1 or scctp2
Forward-2	W31	XXX=scctp1 or scctp2
Return-2	W56	XXX=scctp1 or scctp2
Control-2	–	XXX=scctp1 or scctp2
Forward-3	W32	XXX=scctp1 or scctp2
Return-3	W57	XXX=scctp1 or scctp2
Control-3	–	XXX=scctp1 or scctp2
Forward-4	W40	XXX=wcctp1 or wcctp2
Return-4	W69	XXX=wcctp1 or wcctp2
Control-4	–	XXX=wcctp1 or wcctp2
Forward-5	W41	XXX=wcctp1 or wcctp2
Return-5	W79	XXX=wcctp1 or wcctp2
Control-5	–	XXX=wcctp1 or wcctp2
Forward-6	W42	XXX=wcctp1 or wcctp2
Return-6	W80	XXX=wcctp1 or wcctp2
Control-6	–	XXX=wcctp1 or wcctp2

Table 2-1. MOC Interfaces with WDISC (cont'd.)

Service	User Interface Channel	Domain Name XXX.ops.nascom.nasa.gov
Forward-7	WA1	XXX=scctp3 or scctp4
Return-7	WB1	XXX=scctp3 or scctp4
Control-7	–	XXX=scctp3 or scctp4
Forward-8	WA2	XXX=scctp3 or scctp4
Return-8	WB2	XXX=scctp3 or scctp4
Control-8	–	XXX=scctp3 or scctp4
Forward-9	WA3	XXX=scctp3 or scctp4
Return-9	WB3	XXX=scctp3 or scctp4
Control-9	–	XXX=scctp3 or scctp4
Forward-10	WC1	XXX=wcctp3 or wcctp4
Return-10	WD1	XXX=wcctp3 or wcctp4
Control-10	–	XXX=wcctp3 or wcctp4
Forward-11	WC2	XXX=wcctp3 or wcctp4
Return-11	WD2	XXX=wcctp3 or wcctp4
Control-11	–	XXX=wcctp3 or wcctp4
Forward-12	WC3	XXX=wcctp3 or wcctp4
Return-12	WD3	XXX=wcctp3 or wcctp4
Control-12	–	XXX=wcctp3 or wcctp4

2.2 Application-Level Interfaces

2.2.1

All application-level interfaces are carried over connections (socket interfaces) that are associated with a particular “desktop” (i.e., the configuration file that defines and controls all the capabilities of one PTP board). Since there are three boards per PTP, there will be three PTP servers (i.e., software processes) running on a single PTP. All application-level interactions are with the specific PTP server associated with that desktop, which limits the allocation of the board to one and only one event at a time. For each customer and service requirement (i.e., data rate and flow direction), a unique desktop must be developed for each PTP board (i.e., [User Interface Channel ID] UIFC). The desktop is determined by the combination of Support Identifier (SUPIDEN), forward UIFC and data rate, and return UIFC and data rate, as applicable for the requested services. Since each UIFC is associated with only one PTP board, the UIFC specified for a scheduled service in the User Schedule Message (USM) provided by the NCCDS is sufficient to identify the correct PTP board to access. However, mission-specific port assignments assure that the correct board is accessed without additional MOC actions. (See References d and e for more information on MOC interactions with the NCCDS.)

2.2.2

The WDISC PTPs are compatible with particular CCSDS data formats for space link communications. Among the Ground Transport Headers they support are IP Data Unit (IPDU), Standard Formatted Data Unit (SFDU), Low Earth Orbit-Terminal (LEO-T), and others. Playback data is available via TBD. Control character strings for the forward data switching are simply American Standard Code for Information Interchange (ASCII) text.

2.2.3

The application-level protocols (layered above TCP/IP) are summarized in Tables 2-2 through Table 2-4.

Table 2-2. Application Level Protocols for Data

Interface Type	“Space Link Format”	“Ground Transport Header”	Document Reference	Content
Return Data	CCSDS	IPDU	r, s	Return telemetry with status header
Return Data	CCSDS	SFDU	t, u	Return telemetry with SFDU header
Return Data	CCSDS	LEO-T	v	Return telemetry with LEO-T header
Forward Data	CCSDS	IPDU	o–q	Command data

Table 2-3. Application Level Protocols for Control and Status

Interface Type	“Space Link Format”	“Ground Transport Header”	Document Reference	Content
Control-forward data switch	N/A	ASCII	N/A	Control character string
Status-forward data processing	N/A	ASCII	N/A	System Heartbeat

NOTE

ASCII character strings are transported over TCP/IP sockets.

Table 2-4. Application Level Protocols for Playback

Interface Type	“Space Link Format”	“Ground Transport Header”	Document Reference	Content
Playback Data	N/A	TBD	j	Files of recorded data

Section 3. Operational Considerations

3.1 Nominal Operations

The WDISC configuration and nominal scenarios are discussed in Reference c. The MOC is responsible for:

- a. Requesting SN service from the DSMC (two to three weeks in advance). See Reference e for a description of this process.
- b. Receiving responses from the NCCDS (typically a USM) that indicates the SN resources (Tracking and Data Relay Satellite [TDRS], antenna, UIFCs) allocated to this support.
- c. Getting connections with the data ports of the appropriate PTPs (prime and backup) at the addresses shown in Table 2-1, using a mission-specific assigned data port number.
- d. (For forward services) sending a control character string to the control port of the prime PTP to set the forward data switch correctly, using the mission-specific assigned control port number.
- e. Receiving WDISC support throughout the scheduled support period.
- f. (For forward services) monitoring the system heartbeat on the control port throughout the scheduled support period.
- g. (At a later time if playback is required) downloading saved files from a PTP TBD.

3.2 Failover Operations

The WDISC provides redundant PTPs to permit failovers with minimal lost support. The MOC is responsible for:

- a. Monitoring the flow of return data and the presence of the forward service system heartbeat (the heartbeat is optional) to identify when support is lost.
- b. Informing the WSC operator of the failure.
- c. Getting connection to the data port of the backup PTP, using the mission-specific assigned data port number.
- d. (For forward services) sending a control character string to reset the forward data switch to the backup position.
- e. (For forward services) requesting the WSC to send a control character string to reset the forward data switch to the backup position.
- f. Resuming support via the backup PTP.

Appendix A. Abbreviations and Acronyms

Acronym	Definition
ASCII	American Standard Code for Information Interchange
CCSDS	Consultative Committee for Space Data Systems
COTS	Commercial off-the-shelf
CSOC	Consolidated Space Operations Contract
DNS	Domain Name System
DSMC	Data Services Management Center
EO-1	Earth Orbiter-1
FTP	File Transfer Protocol
FUSE	Far Ultraviolet Spectroscopic Explorer
GALEX	Galaxy Evolution Explorer
GP-B	Gravity Probe B
GSFC	Goddard Space Flight Center
ICD	Interface control document
ID	Identifier
IONET	IP Operational Network
IP	Internet Protocol
IPDU	IP data unit
LDB	Long Duration Balloon
LEO-T	Low earth orbit-terminal
LI	Local interface
MOC	Mission Operations Center
NASA	National Aeronautics and Space Administration
NCC	Network Control Center
NCCDS	Network Control Center Data System
NCCMS	Network Control Center Miscellaneous Systems
NISN	NASA Integrated Services Network
NMP	New Millennium Program
PMP	Project Management Plan
PTP	Programmable Telemetry Processor

Acronym	Definition
SERB	Sustaining Engineering Review Board
SFDU	Standard formatted data unit
SN	Space Network
STGT	Second TDRSS Ground Terminal
SUPIDEN	Support Identifier
TCP	Transmission Control Protocol
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TIMED	Thermosphere Ionosphere Mesosphere Energetics and Dynamics
UIFC	User interface channel ID
ULDB	Ultra Long Duration Balloon
USM	User schedule message
WDISC	WSC TCP/IP Data Interface Service Capability
WSC	White Sands Complex
WSGT	White Sands Ground Terminal

Appendix B. External and Internal WDISC Interfaces

B.1 TCP/IP Connectivity

See Figure B-1, WDISC User Interface Channels.

B.1.1 IP Addresses

WDISC provides eight PTPs that are accessible via the Closed IONET. IP addresses are obtained by resolving server aliases (i.e., domain names) to IP addresses. NISN operates a Domain Name System (DNS) server supporting PTP server aliases to permit a client's DNS Name Resolvers to perform this service. Table B-1 lists the aliases for each PTP located at Second TDRSS Ground Terminal (STGT) or White Sands Ground Terminal (WSGT).

Table B-1. IP Address Aliases

PTP Identifier	Domain Name
STGTPTP1	scctp1.ops.nascom.nasa.gov
STGTPTP2	scctp2.ops.nascom.nasa.gov
STGTPTP3	scctp3.ops.nascom.nasa.gov
STGTPTP4	scctp4.ops.nascom.nasa.gov
WSGTPTP1	wcctp1.ops.nascom.nasa.gov
WSGTPTP2	wcctp2.ops.nascom.nasa.gov
WSGTPTP3	wcctp3.ops.nascom.nasa.gov
WSGTPTP4	wcctp4.ops.nascom.nasa.gov

B.1.2 TCP Port Assignments

Each PTP has three identical boards. Each board has TCP/IP interfaces for forward and return data services, as well as for control and status. Mission-specific port assignments are used to access the correct board without further customer actions.

B.2 Serial Data Configuration

Two sets of primary and backup PTPs are located at each ground terminal. The serial interfaces of corresponding boards of the prime and backup PTPs are connected to specified LI ports. Each pair of return serial interfaces shares a specified return LI port. Each pair of forward serial interfaces is connected to its forward LI port via a forward data switch. Table B-2 describes the configuration of each board. The corresponding UIFCs are also indicated.

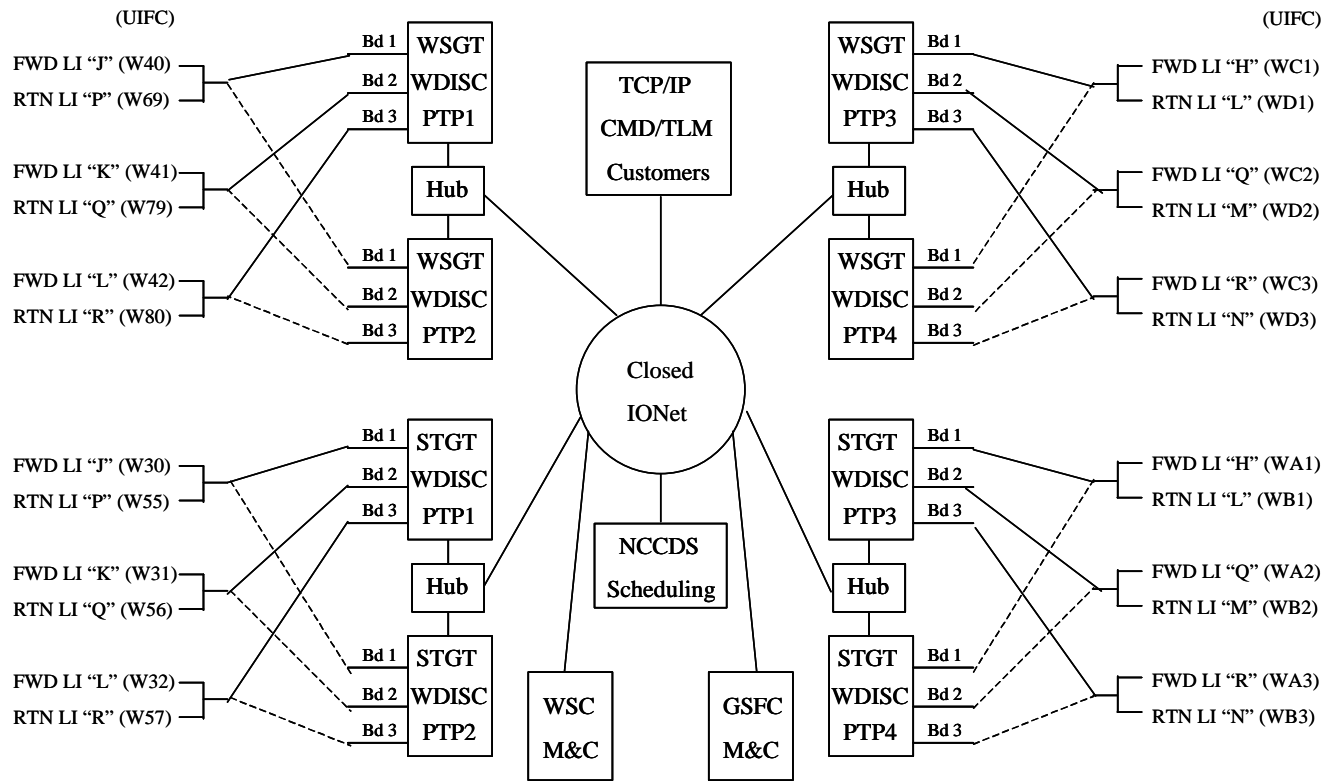


Figure B-1. WDISC User Interface Channels

Table B-2. WDISC Internal Configuration

PTP Identifier	Board Identifier	Forward LI Port (UIFC)	Return LI Port (UIFC)
STGTPTP1	Board 1	J (W30)	P (W55)
STGTPTP1	Board 2	K (W31)	Q (W56)
STGTPTP1	Board 3	L (W32)	R (W57)
STGTPTP2	Board 1	J (W30)	P (W55)
STGTPTP2	Board 2	K (W31)	Q (W56)
STGTPTP2	Board 3	L (W32)	R (W57)
STGTPTP3	Board 1	H (WA1)	L (WB1)
STGTPTP3	Board 2	Q (WA2)	M (WB2)
STGTPTP3	Board 3	R (WA3)	N (WB3)
STGTPTP4	Board 1	H (WA1)	L (WB1)
STGTPTP4	Board 2	Q (WA2)	M (WB2)
STGTPTP4	Board 3	R (WA3)	N (WB3)
WSGTPTP1	Board 1	J (W40)	P (W69)
WSGTPTP1	Board 2	K (W41)	Q (W79)
WSGTPTP1	Board 3	L (W42)	R (W80)
WSGTPTP2	Board 1	J (W40)	P (W69)
WSGTPTP2	Board 2	K (W41)	Q (W79)
WSGTPTP2	Board 3	L (W42)	R (W80)
WSGTPTP3	Board 1	H (WC1)	L (WD1)
WSGTPTP3	Board 2	Q (WC2)	M (WD2)
WSGTPTP3	Board 3	R (WC3)	N (WD3)
WSGTPTP4	Board 1	H (WC1)	L (WD1)
WSGTPTP4	Board 2	Q (WC2)	M (WD2)
WSGTPTP4	Board 3	R (WC3)	N (WD3)

NOTE

L1 port assignments use the designations found in Reference f.

CSOC-GSFC-
RD-002056
(Supersedes
451-WDISC-
SSD 98)

**WSC Transmission Control Protocol (TCP)
/Internet Protocol (IP) Data Interface Service
Capability (WDISC) Service Specification**

Original